Fig.1 The increase in circumference is dependent on the relation between width vs. depth of a channel (s = width/depth). The cross section is constant. For example: A channel, which is 10 times wider than deep has an increase of more than 50% capillary force in comparison to a square one.
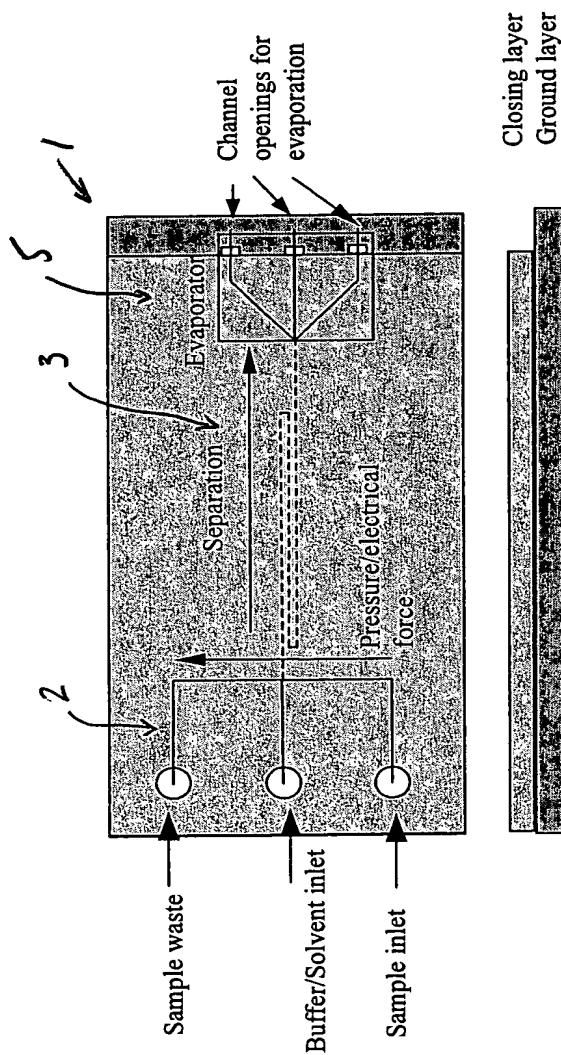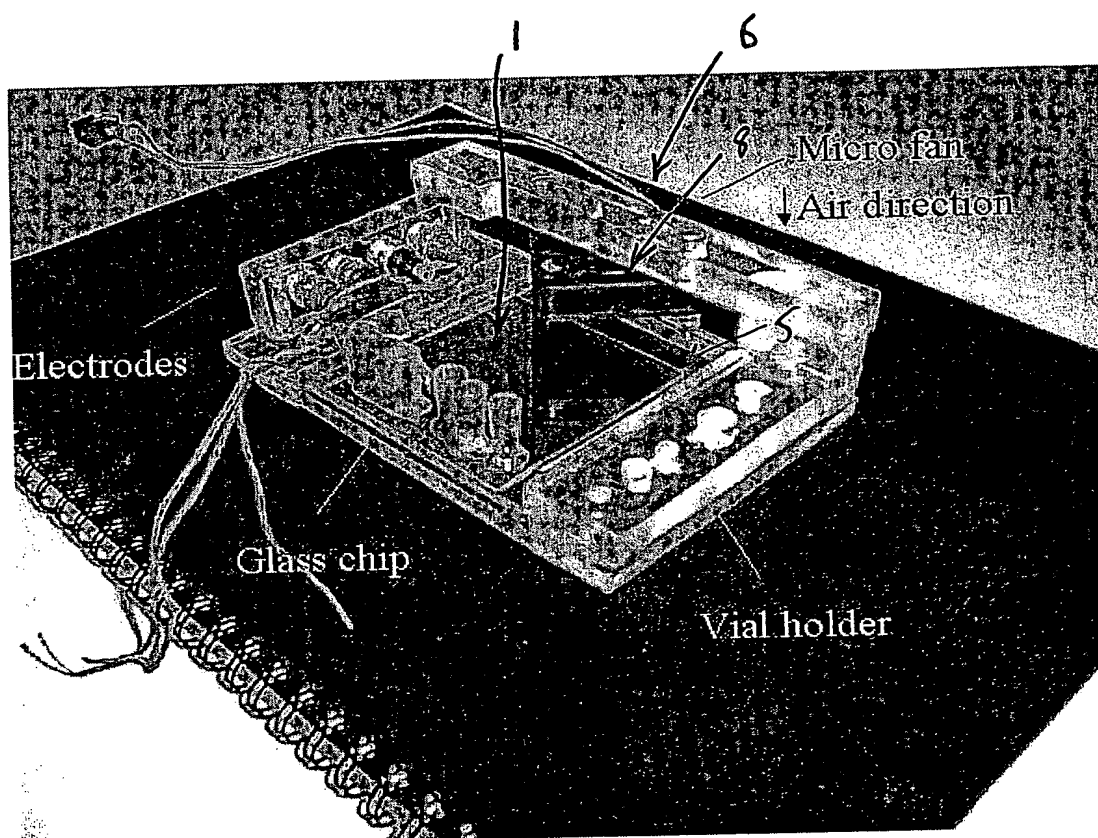
fig. 2

Labels in figure:
- Channel openings for evaporation
- Closing layer
- Ground layer
- Evaporator
- Separation
- Pressure/electrical force
- Sample waste
- Buffer/Solvent inlet
- Sample inlet
- 1
- 2
- 3
- 5

Fig. 3 Chip holder for 3in x 3in glass chips compatible with standard microscope stages; includes a micro fan for constant "fresh" air, vial holders and electrodes for sample injection
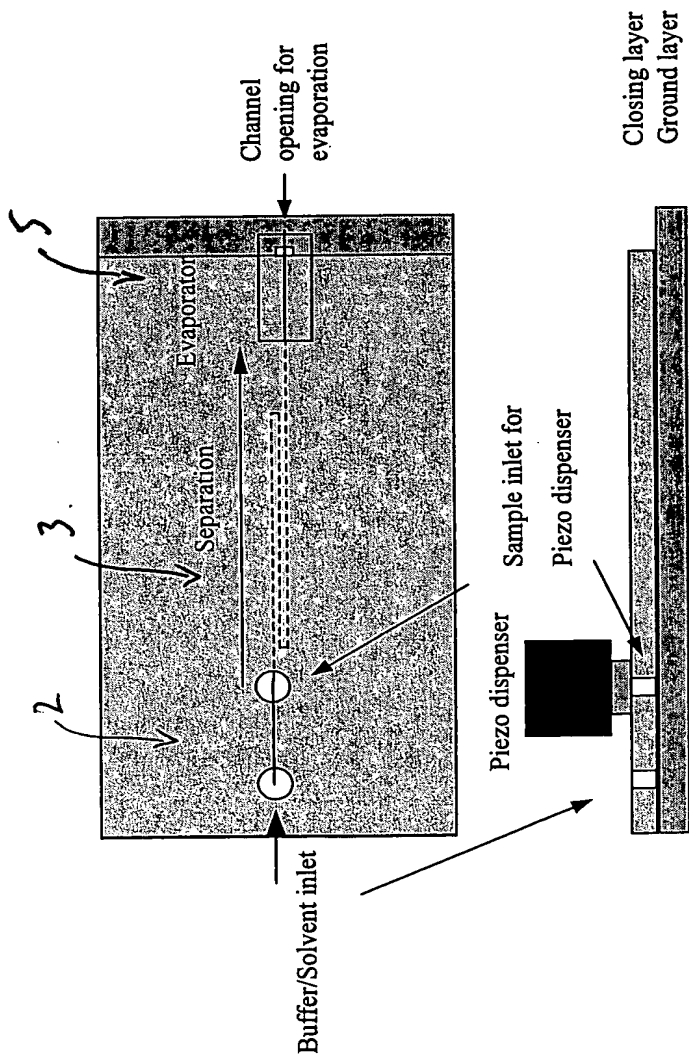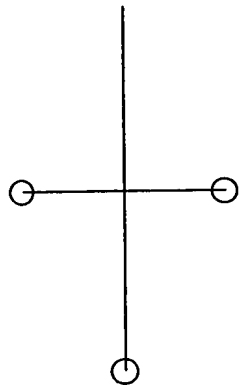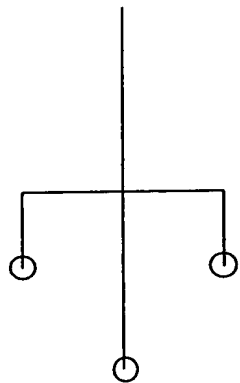
Channel opening for evaporation

Evaporation

Separation

Buffer/Solvent inlet

Piezo dispenser

Sample inlet for Piezo dispenser

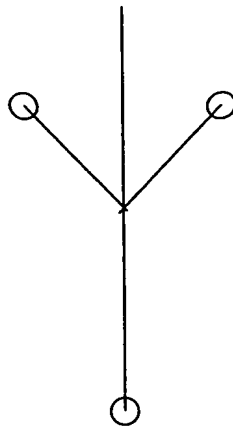Closing layer
Ground layer

fig. 4

Inlets

T-Inlet classic

Fig. 5(a)

T-Inlet, modified

Fig. 5(b)

T-Inlet, anti-stream

Fig. 5(c)

Inject-Inlet

Fig. 5(d)

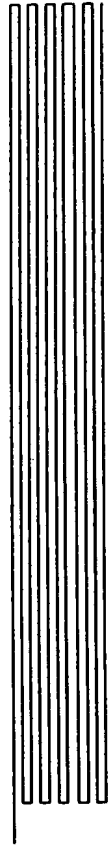Separation Channel

Fig. 6(a)
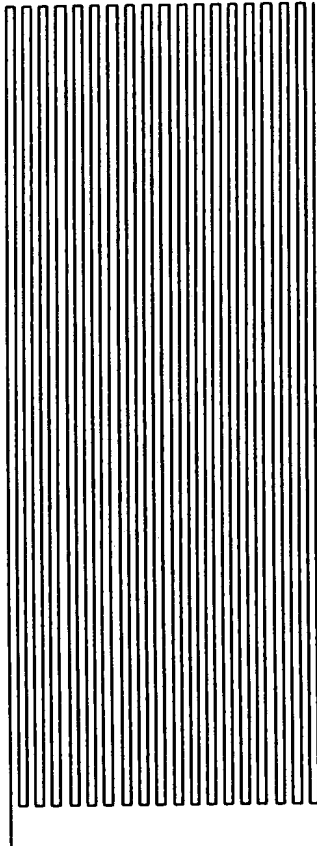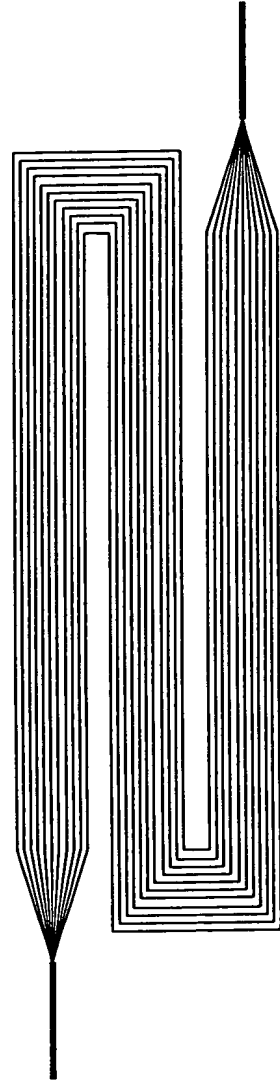
Single channel straight

Fig. 6(b)

Single channel meander

Fig. 6(c)

Single channel meander extra long

Fig. 6(d)

Channel bundle parallel, meander
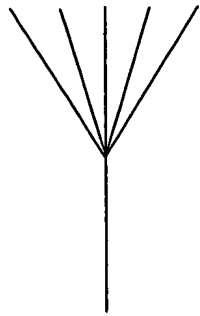
Evaporators

Funnel-shape

Fig. 7(b)

Single channel
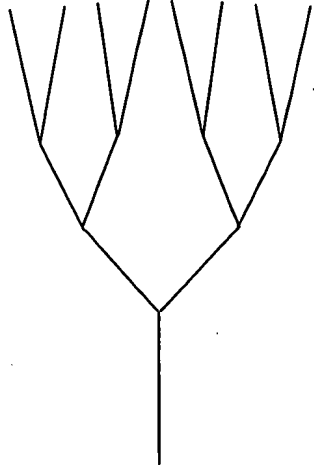
fig. 7(a)

Multi Channel Evaporators
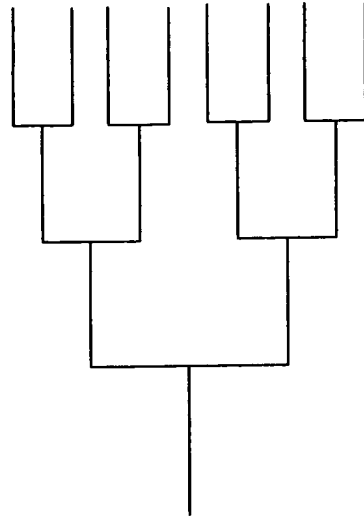
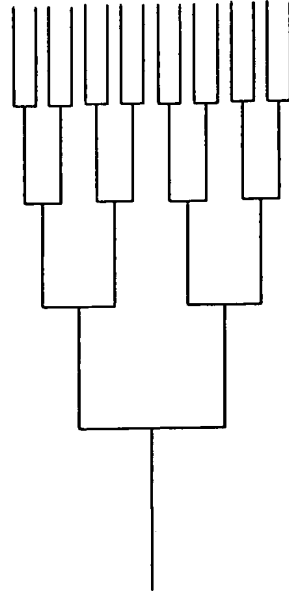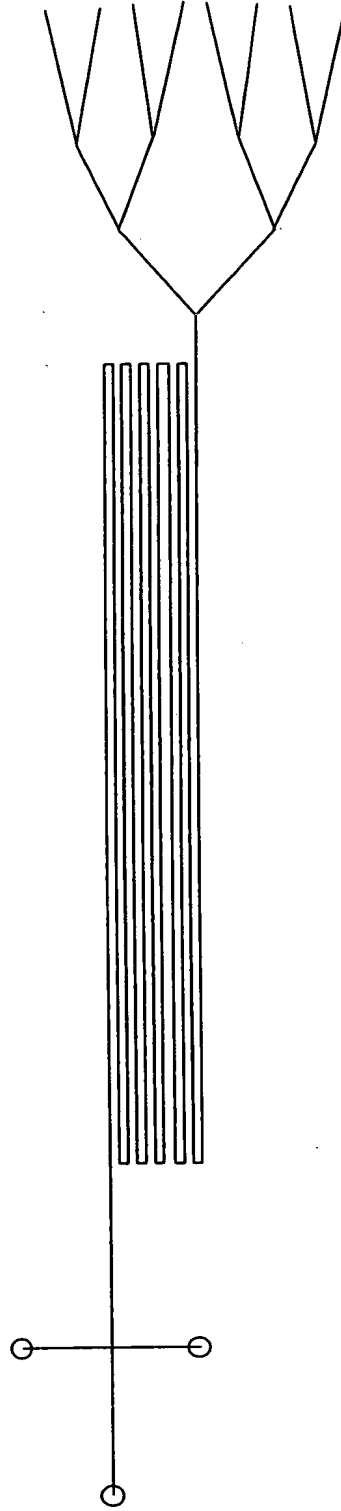Umbel-Shape

Fig. 8(a)

Root-Shape

Fig. 8(b).

Fig. 8(c)

Fig. 8(d)

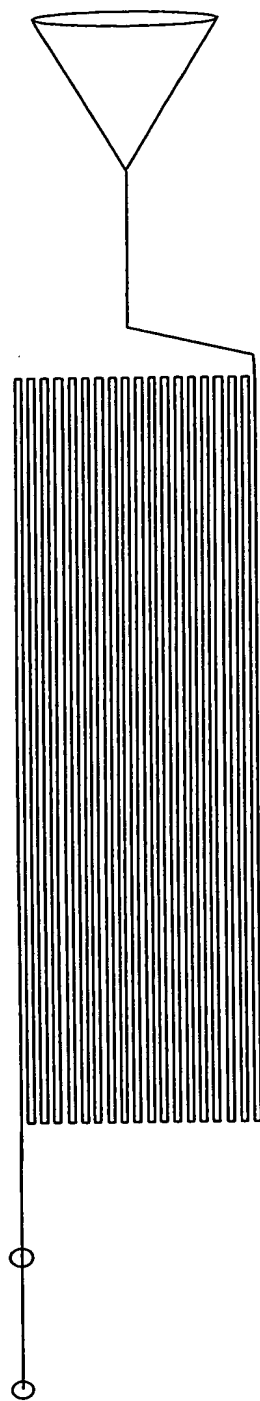1:1 Splitter, rectangular 3-fold

1:1 splitter, rectangular 4-fold

Fig 9

Chip design with classic T-inlet and medium length meander single channel Separator including multi channel root-shape evaporator; all channel dimensions a the same (10μm wide and 0.5μm deep)
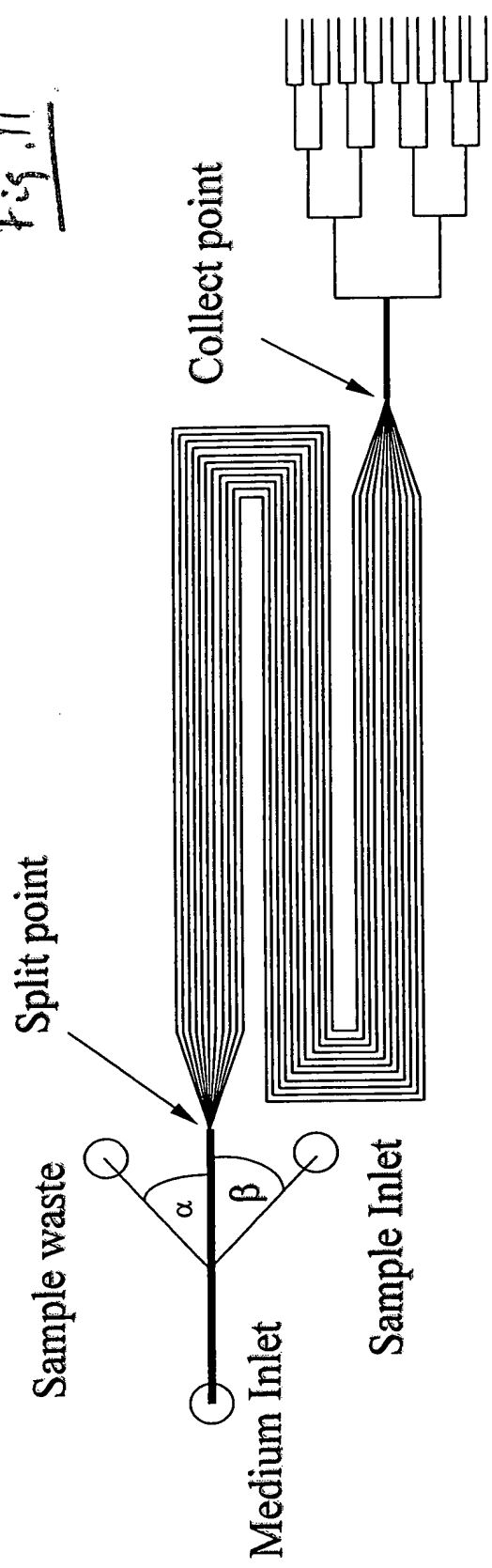
Fig. 10

Chip design with inject-inlet including extra long single meander channel for separation ; funnel-evaporator

Fig. 11

Chip design including an anti-stream inlet with different angles (α, β) for sample inlet and sample waste, channel dimensions vary between the different regions; bundle of 11 separation channels meandering parallel; evaporator 4-fold 1:1 splitter
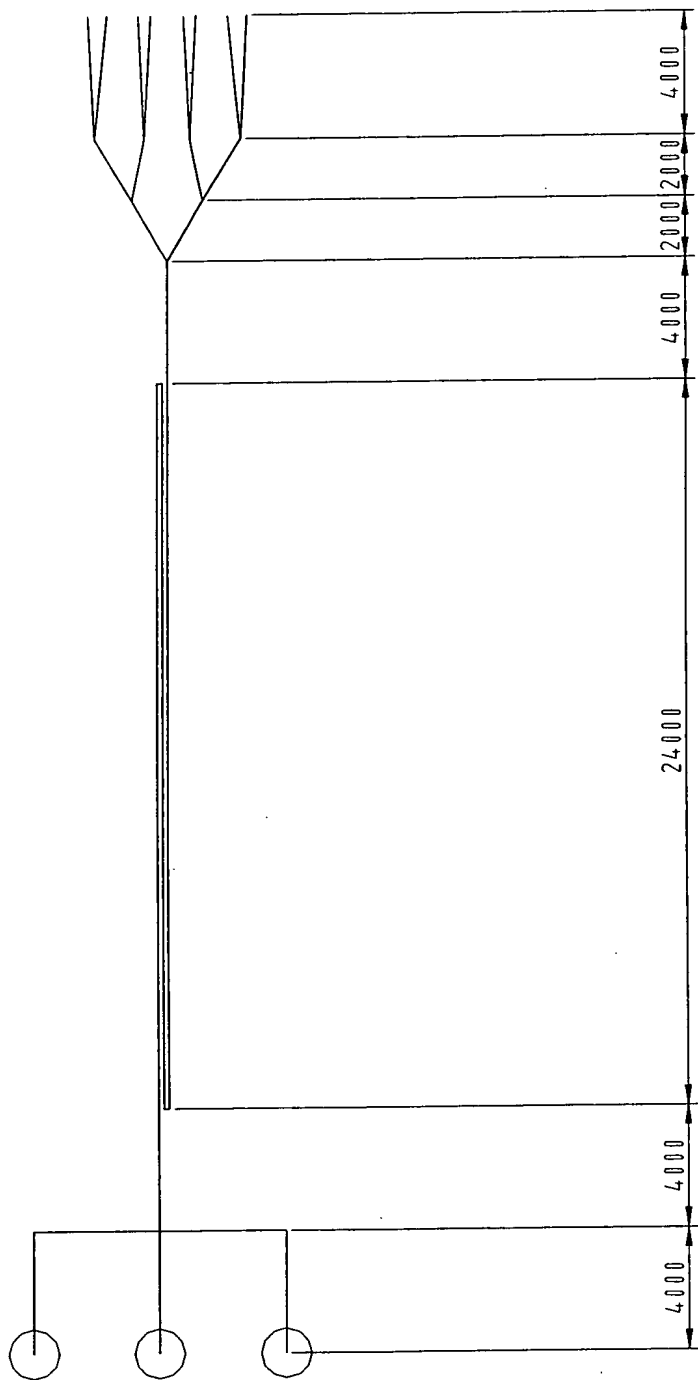
Fig. 12
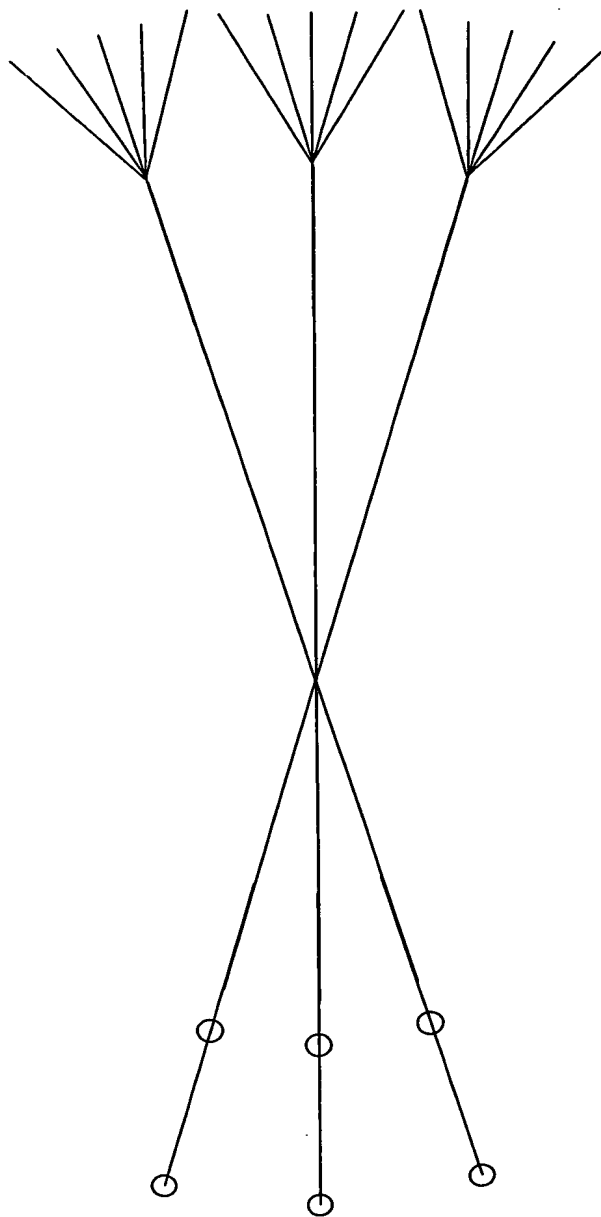
Chip design for a three compound synthesis including three umbel-shape evaporators and three inject-inlets

Ground chip layer

Top chip layer
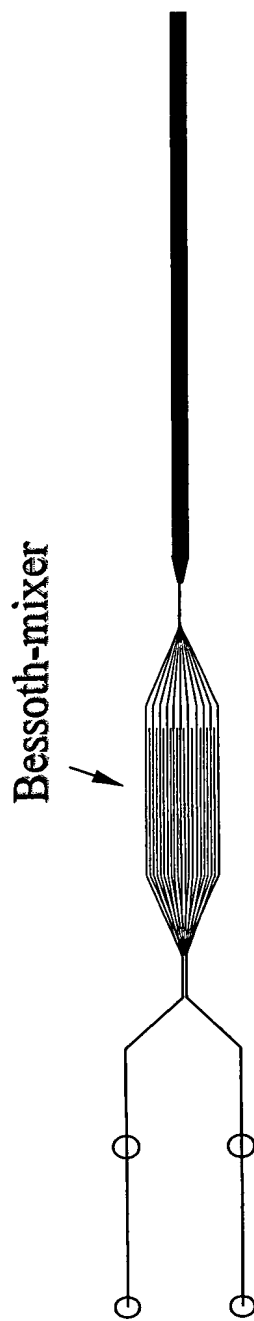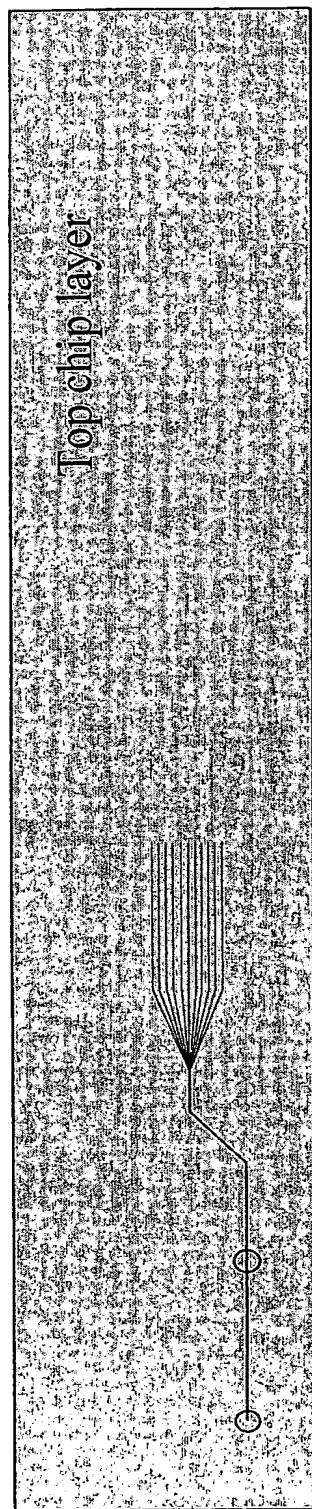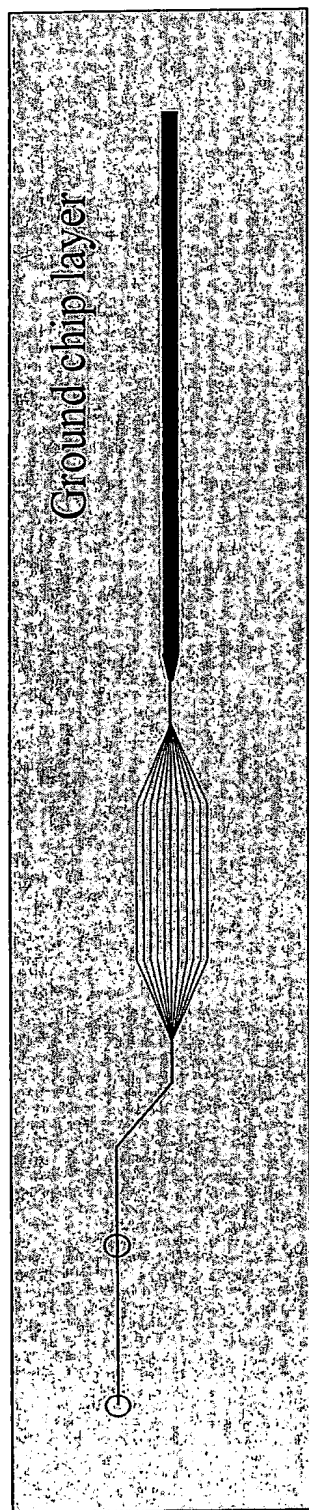
Bessoth-mixer

Chip design for Immuno-assays including two inject-inlets on two diffent layers and following "Bessoth-mixer"(Lit); single wide channel evaporator

Fig. 13

design pop02: created 04-04-2000 @ Nils Goedecke

4000

2000 2000 2000

4000

24000

4000

4000

Channel width 110µm after etching, depth 25 µm over the whole structure

Fig. 14(a)

Fig. 14 (b)

design pop02, created 04-04-2000 @ Nils Goedecke
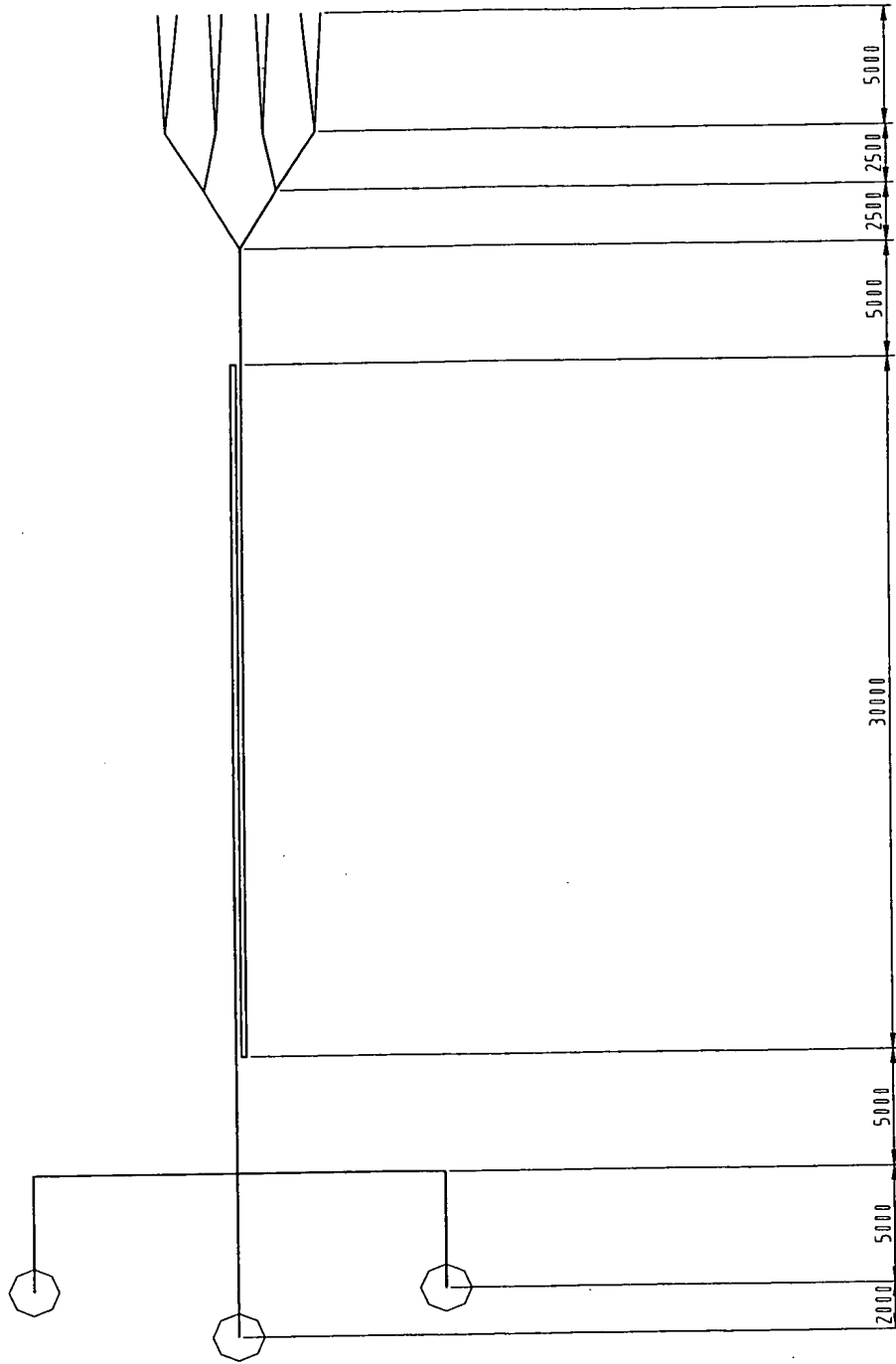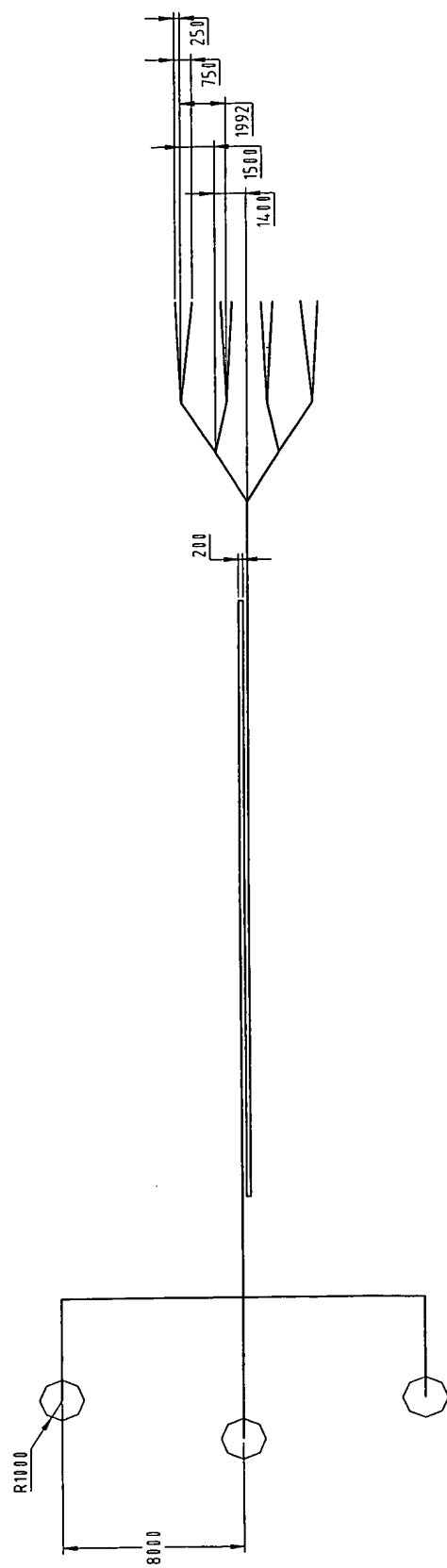
250
750
2000
2800

200

R1000

5000
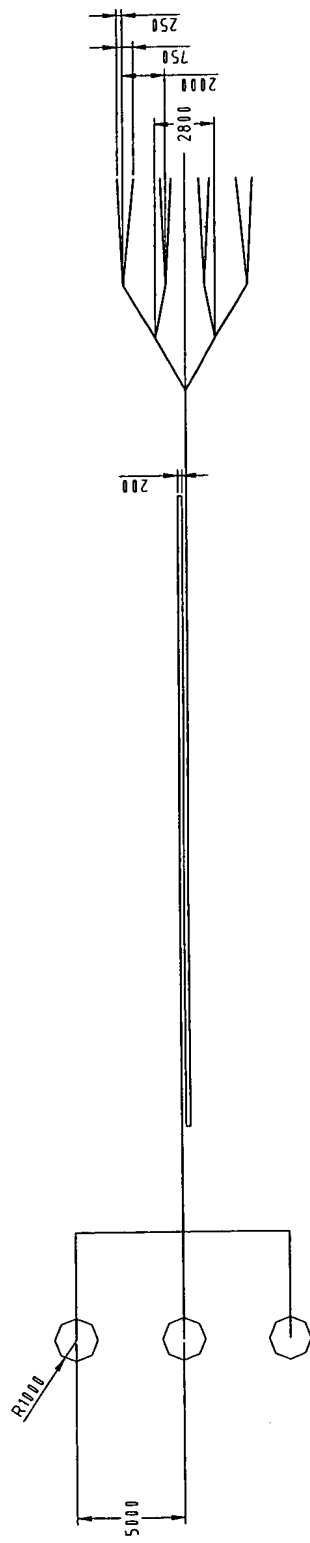
Fig 15(a)

channel width 40 microns for each design

design pop03a by Nils Goedecke 23. June 2000 IC Department of Chemistry

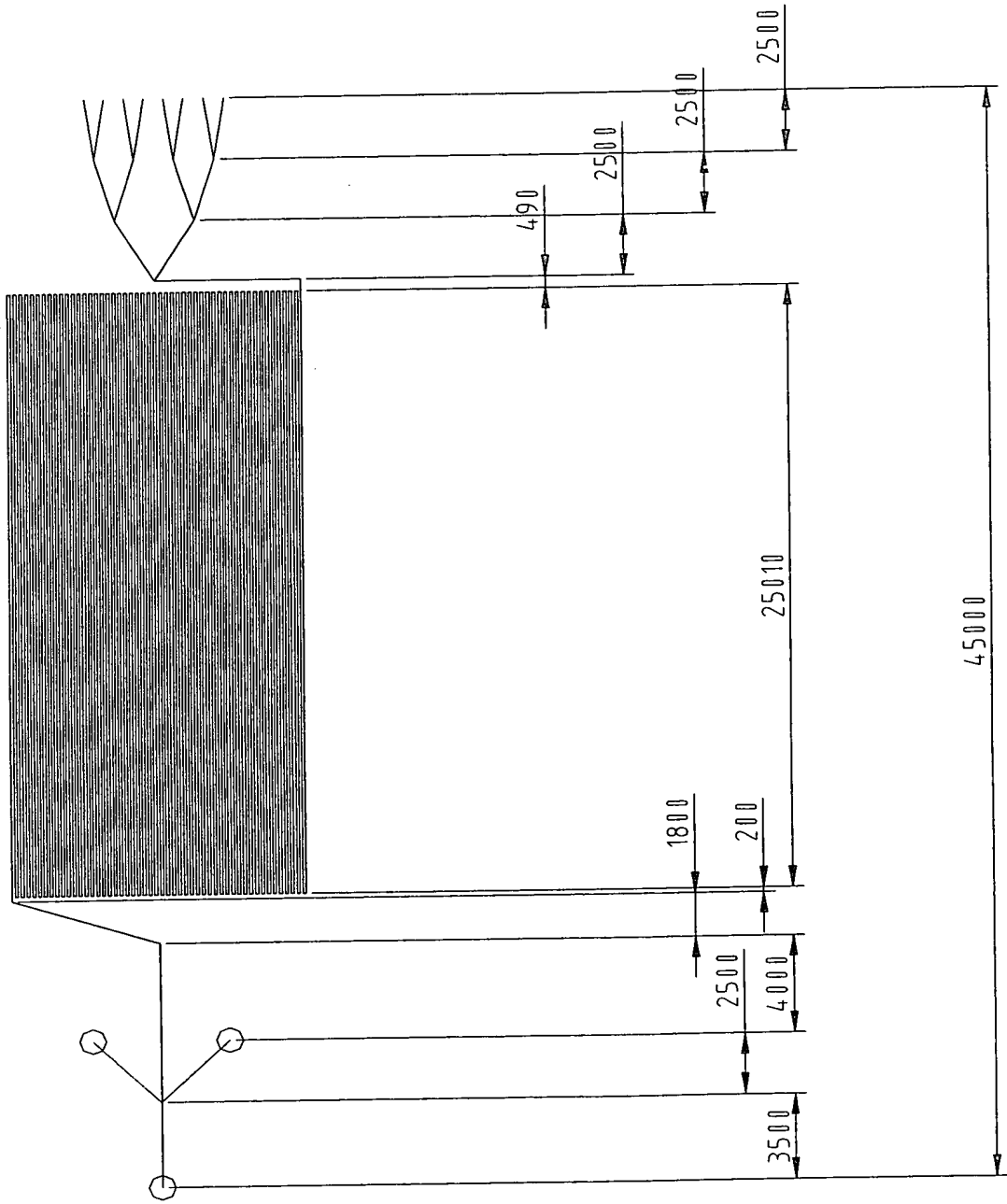**Channel width after etching 60μm; depth 10 μm**

250

750

1992

1500

1500

1400

200

channel width 40 microns for each design

design pop03a by Nils Goedecke 23. June 2000 IC Department of Chemistry

Fig. 15(b)

R1000

8000

490

2500

2500

2500

2500

4000

3500

1800

200

25010

45000

Design lim 01: S.I. 5; Sep.Ch.W. 10; EVvap.Ch.W.10 by Nils Goedecke 05.07.2000.

Fig. 16 a)

2625
1125
750
375

220
110

R500

2560

5120

5560
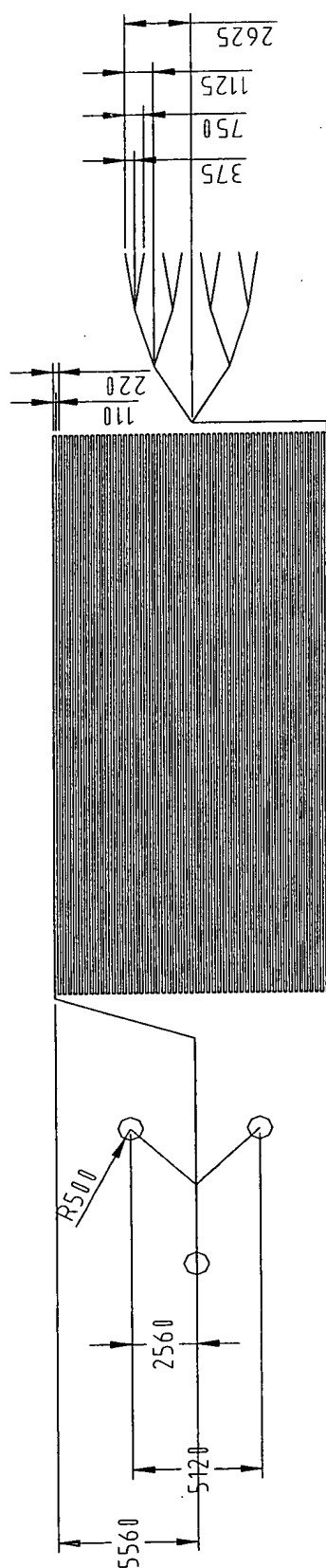
This layout includes the anti-stream-inlet and a 2.5m separation channel. Theoretically, a channel of this length 10µm wide and 0.1µm deep if running with a η ~ 40 has an efficiency of more than 500000 theoretical plates in 10 min run time.

Design lim 01: S.I. 5; Sep.Ch.W. 10; EVvap.Ch.W. 10 by Nils Goedecke 05.07.2000
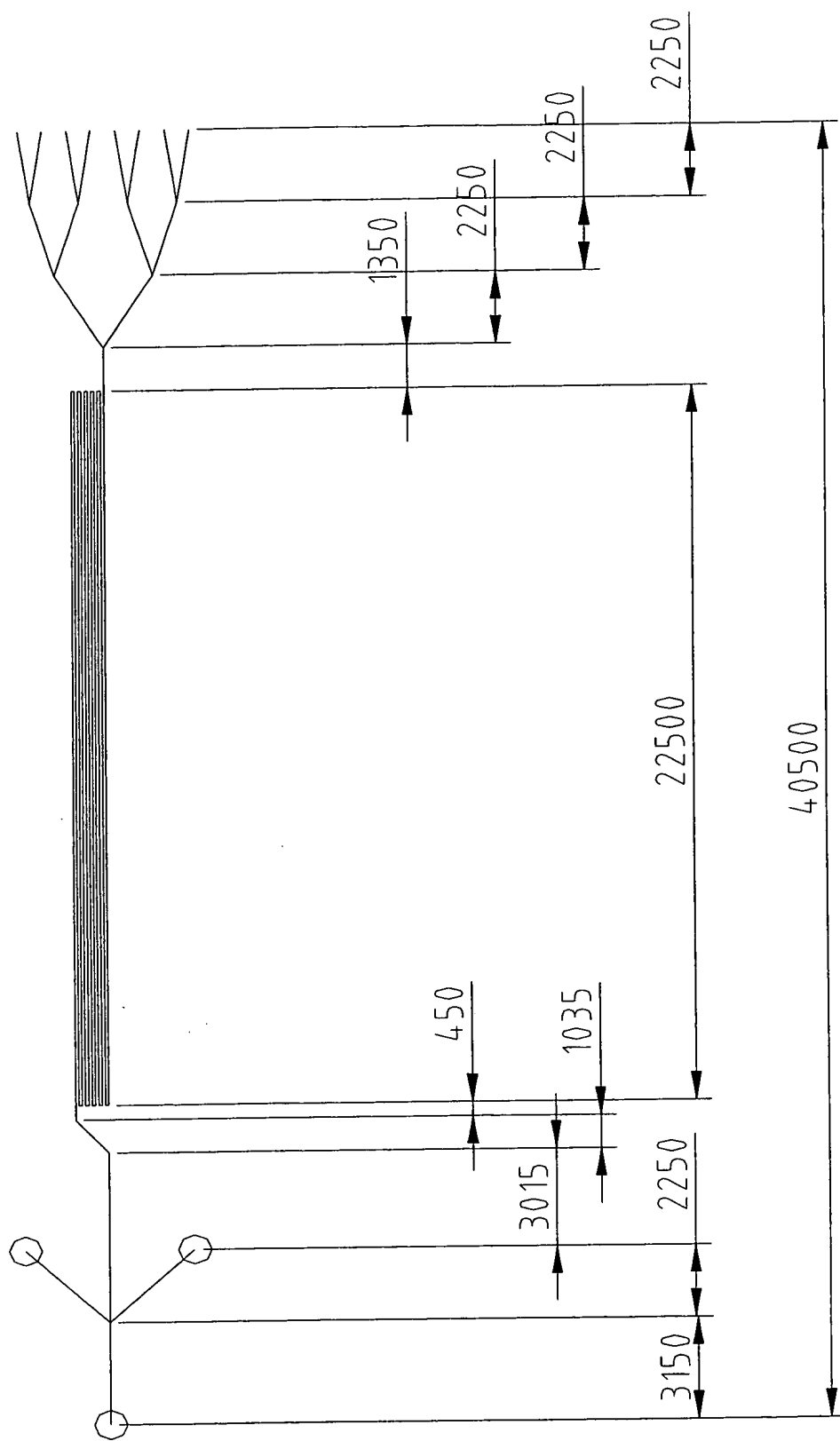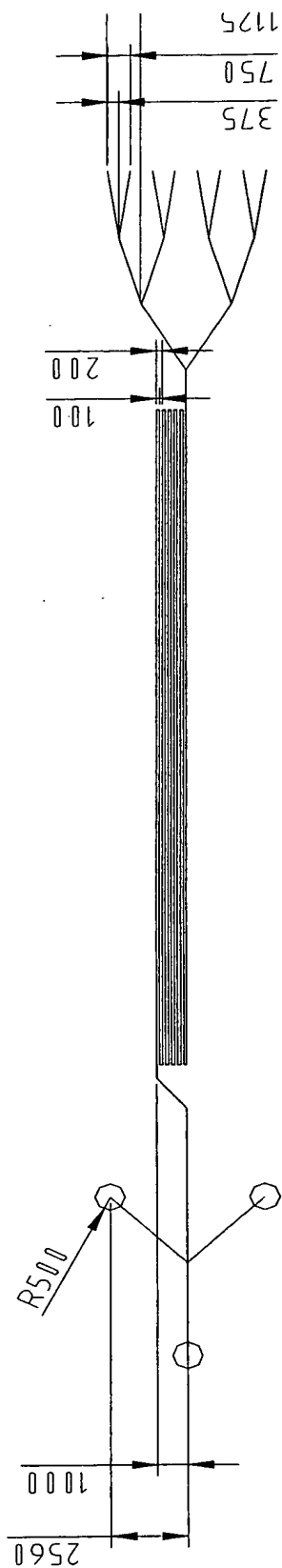
Fig. 16 (b)

fig. 17(a)

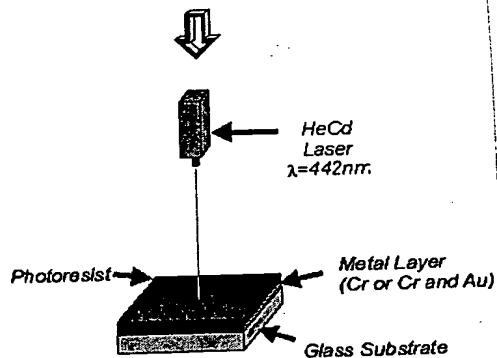Design lim 02 S.I. 5 Sep.Ch.W. 10 EVvap.Ch.W.10 by Nils Goedecke 09.11.2000

1175
750
375

200
100

R500

1000
2560

Fig.17(b)

Design lim 02 S.I. 5 Sep.Ch.W. 10 EVvap.Ch.W.10 by Nils Goedecke 09.11.2000

a). Design structure
using CAD package
and convert to
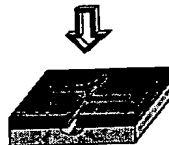machine format

b). Expose
photoresist
using DWLII
system

*HeCd
Laser
λ=442nm.*

Photoresist

*Metal Layer
(Cr or Cr and Au)*

Glass Substrate

c). Develop
photoresist

d). Etch Metal
Layer

e). Etch Glass

f). Remove Photoresist
and Metal Layer
Thermally bond to
coverplate

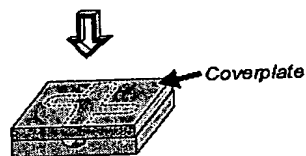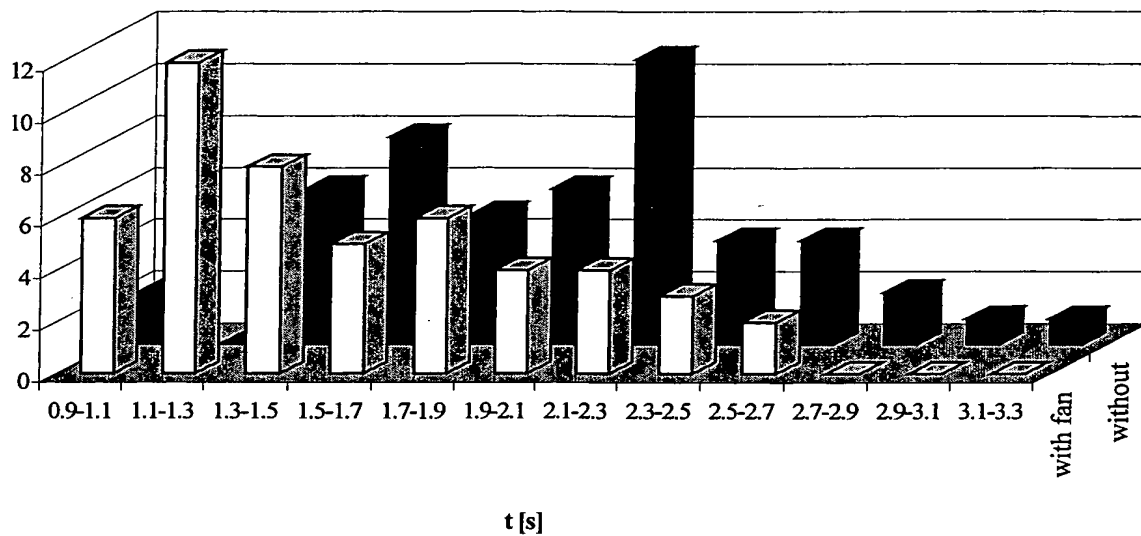*Coverplate*

Fig. 18

1

Velocity differences within the channel (60x20μm) for 10μm latex beads in a pop02 chip driven through evaporation with and without "air condition"; measurement with 50 beads each; The average velocity with the "air condition" switched on is slightly higher than without it – visible in the left shift of the profile.

Fig. 19